Kiss Carpal Tunnel Goodbye!

Peak Ergonomics

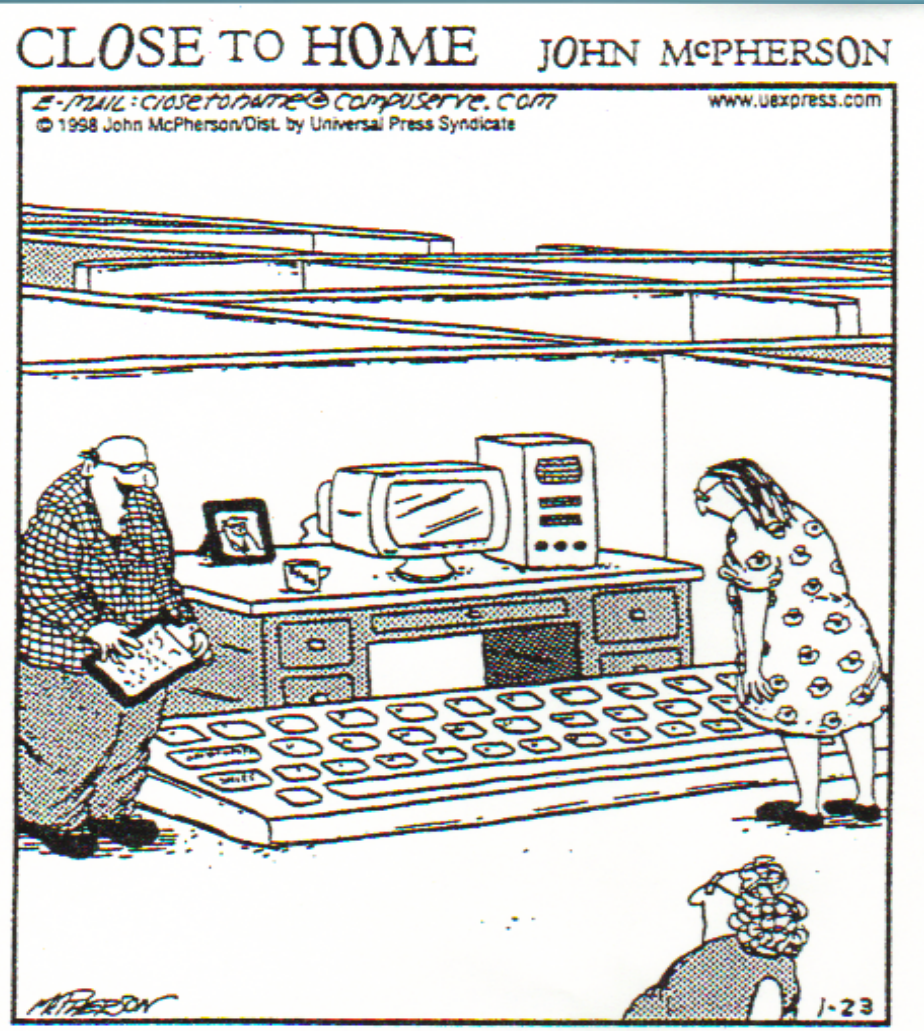
PeakErgo.com

23rd Annual Missouri

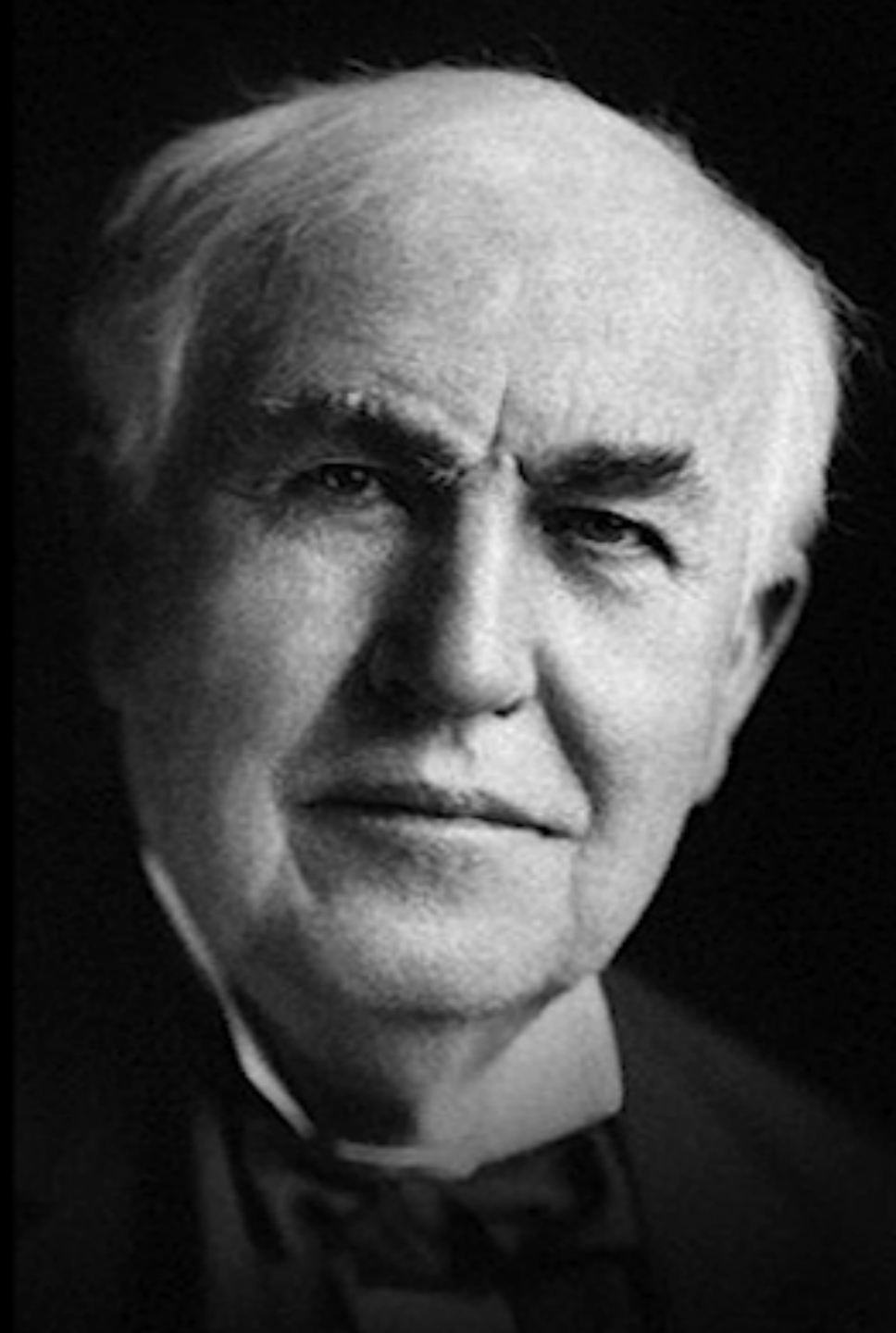
WORKERS' COMPENSATION

C·O·N·F·E·R·E·N·C·E

JUNE 5-6, 2017 • TAN-TAR-A RESORT • OSAGE BEACH, MO



"Your carpal tunnel syndrome should clear up in two weeks, plus you'll burn 500 calories an hour."



“The doctor of the future will give no medicine, but will instruct his patients in care of the human frame, in diet and in the cause and prevention of disease.”

- Thomas Edison

Paul D. Krewson, OTR/L, CEAS III

- President - Peak Ergonomics
- Occupational Therapist, Ergonomist
- 1997-2004: Out-patient Ortho Rehabilitation
- 2004-present: Work Injury Prevention and Early Intervention Consulting

Please

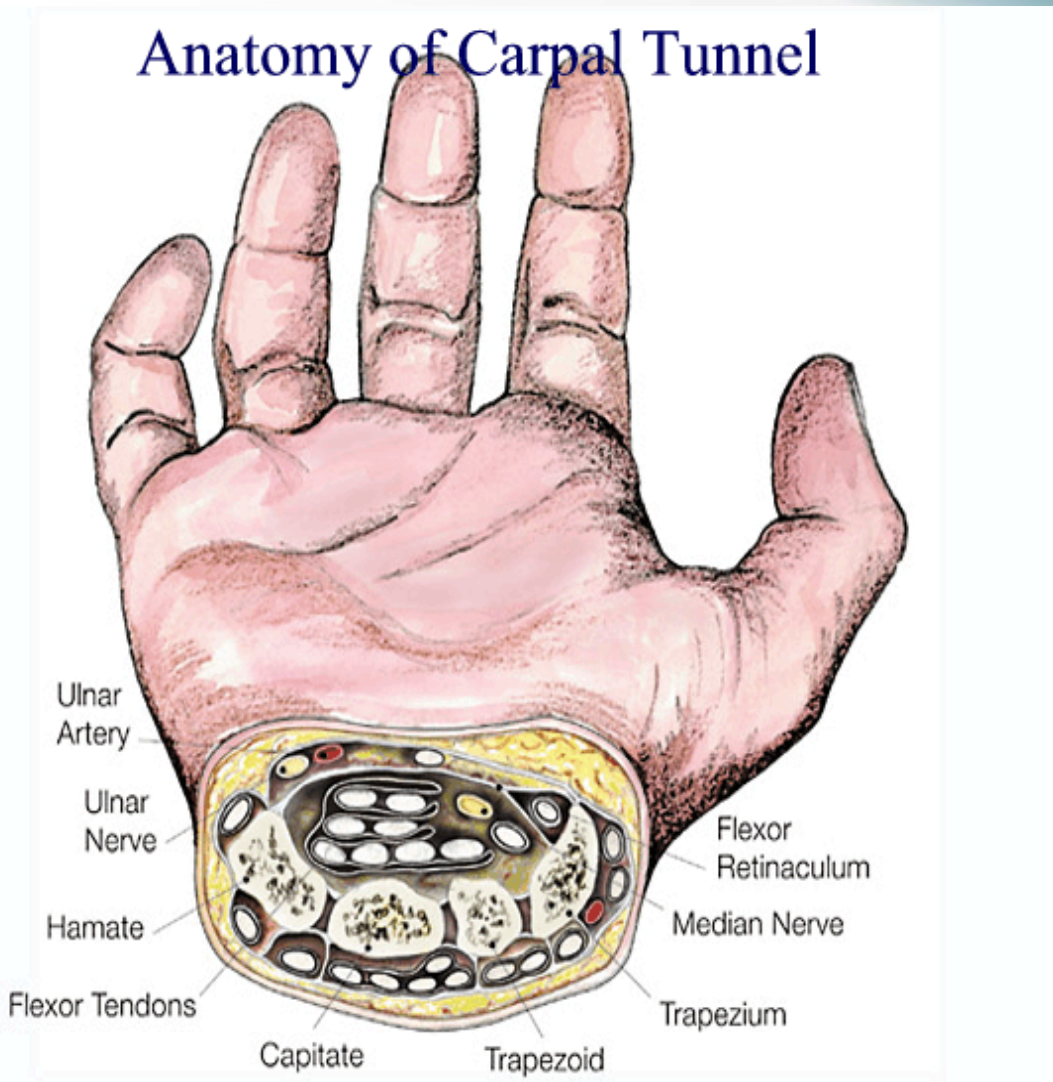
- Please participate and be cautious if you have any medical conditions.
- Please silence phones and do not use them.
- Please hold all questions until the end.
- Thank you

Understanding Carpal Tunnel Syndrome

- Anatomy
- Pathology
- Progression of illness
- Risk Factors
- Prevention
  - Ergonomics
  - Education
  - Exercise
  - Early intervention
- Consequences of failed prevention

Anatomy: The Carpal Tunnel

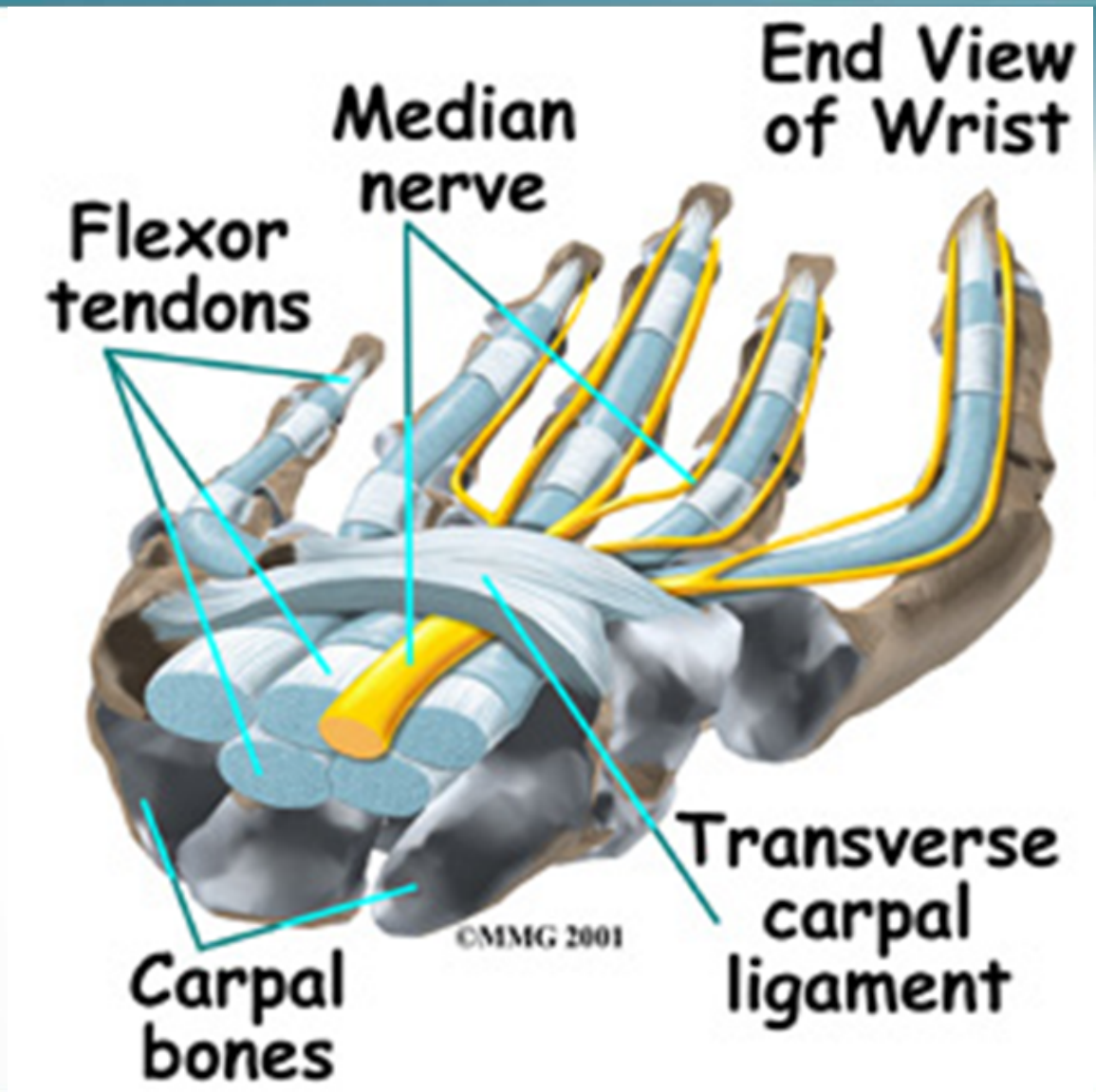
- The Carpus
  - Floor and walls
- Flexor retinaculum or transverse carpal ligament
  - Scaphoid tubercle
  - Ridge of trapezium
  - Ulnar aspect of hook of hamate and pisiform



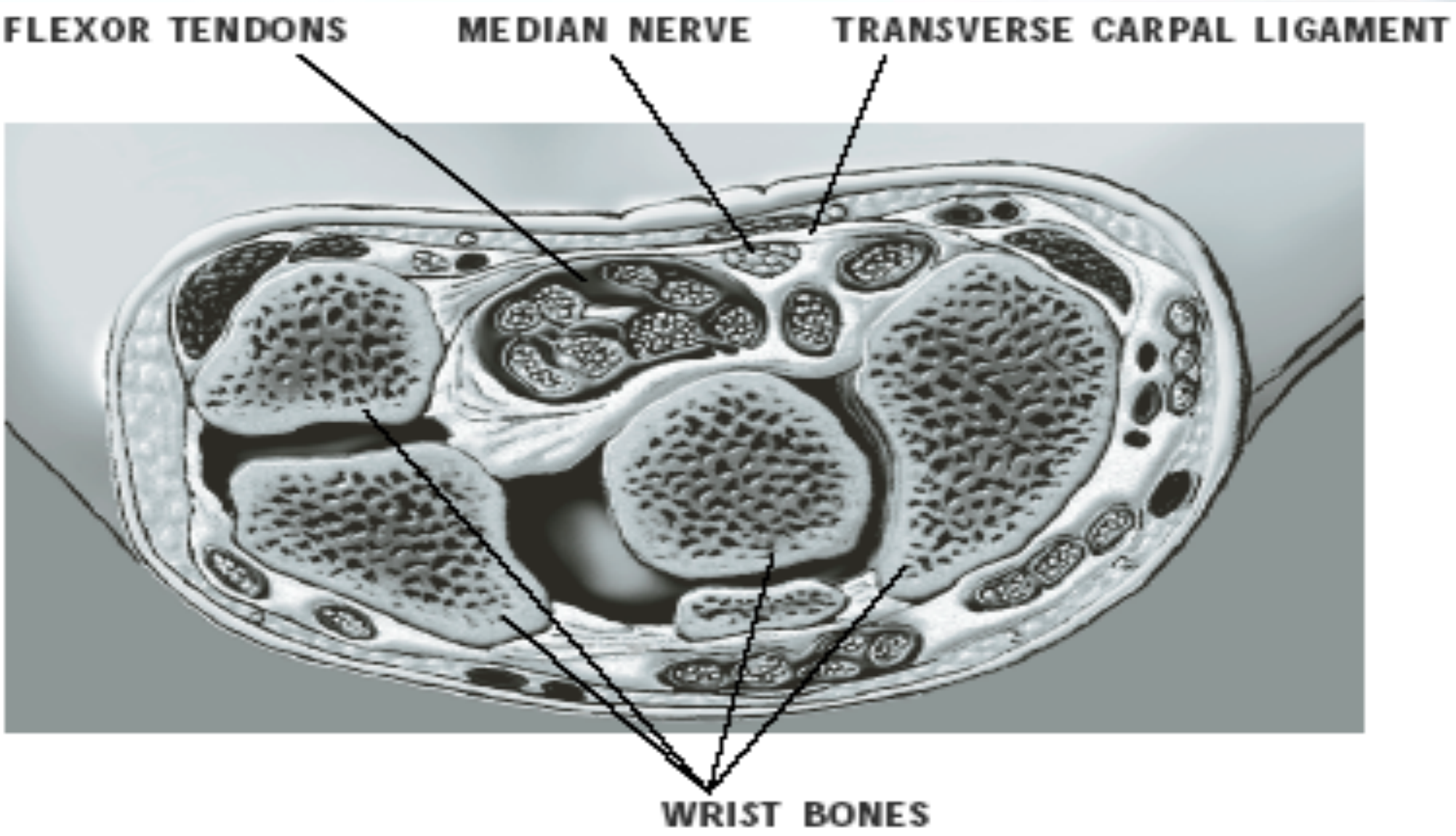
Inside the Carpal Tunnel

The Carpal Tunnel

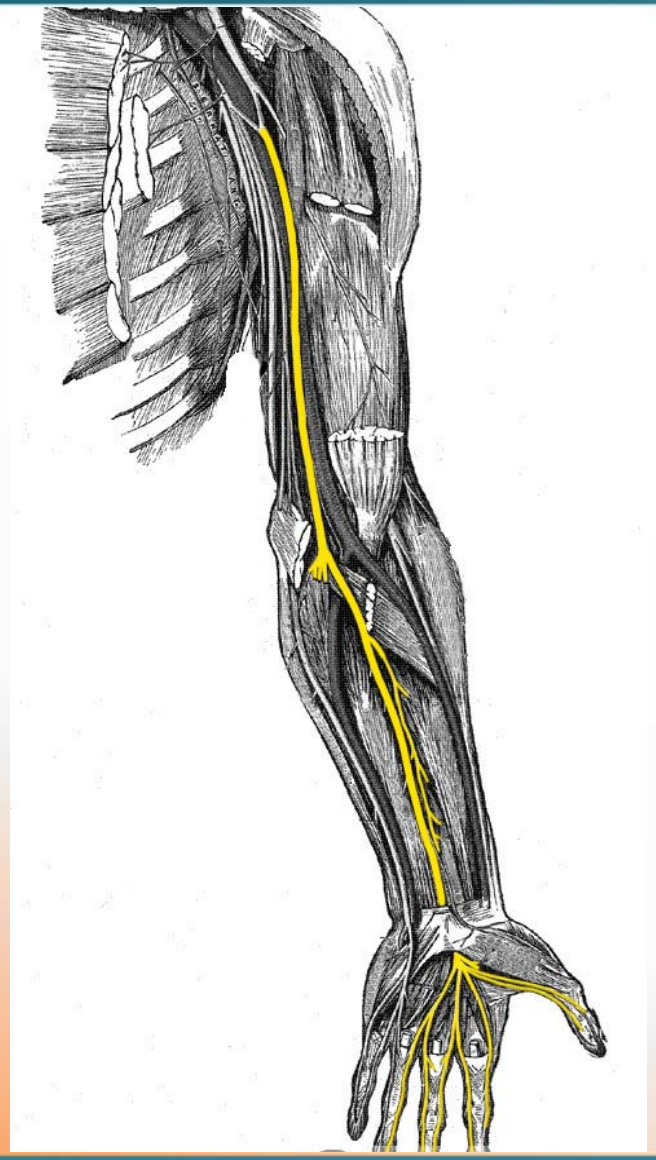
- Flexor Tendons
  - Common synovial sheath
- Flexor pollicis longus
  - Separate synovial sheath
  - Radial aspect
- Median Nerve



Carpal Tunnel Anatomy

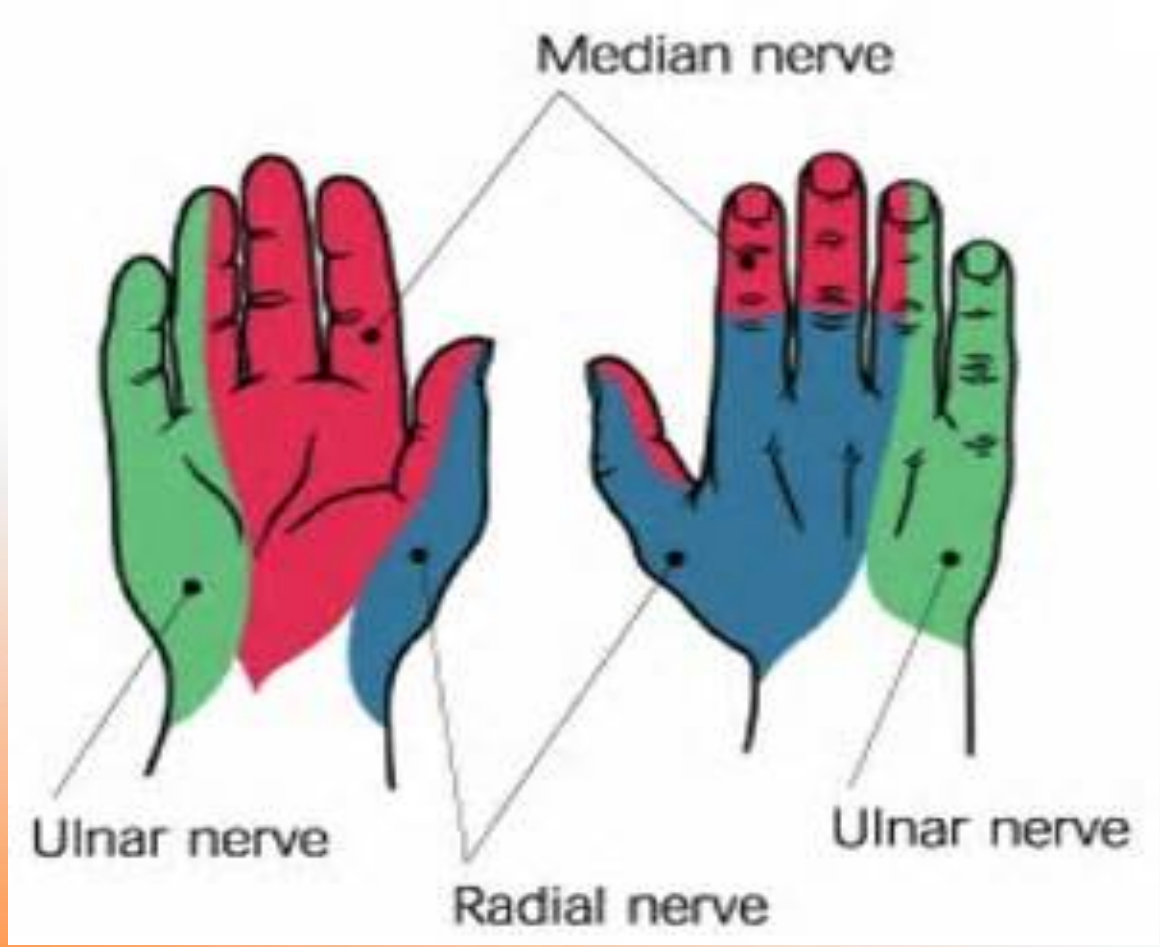


Median Nerve Anatomy

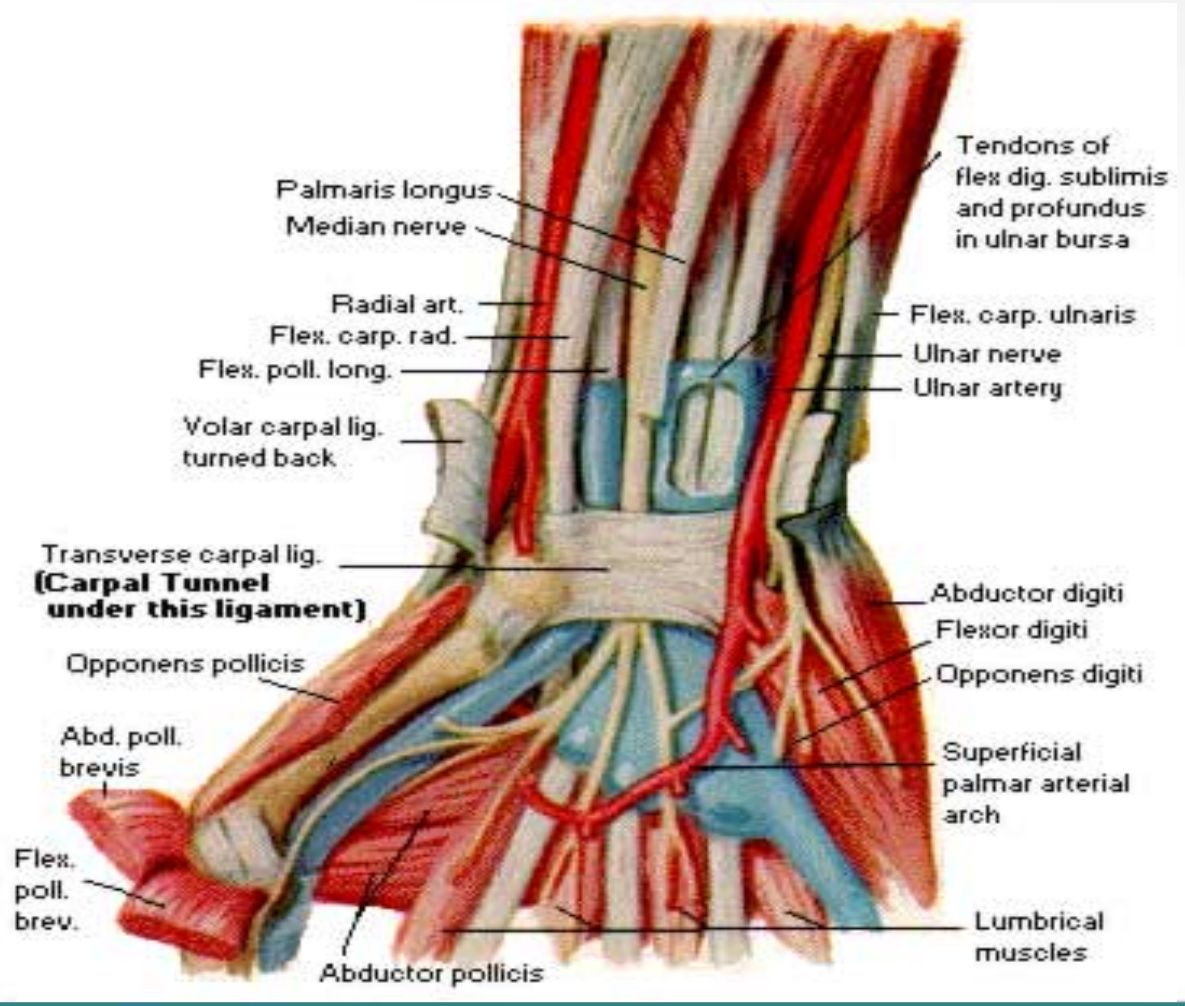


Median Nerve Function

Sensation

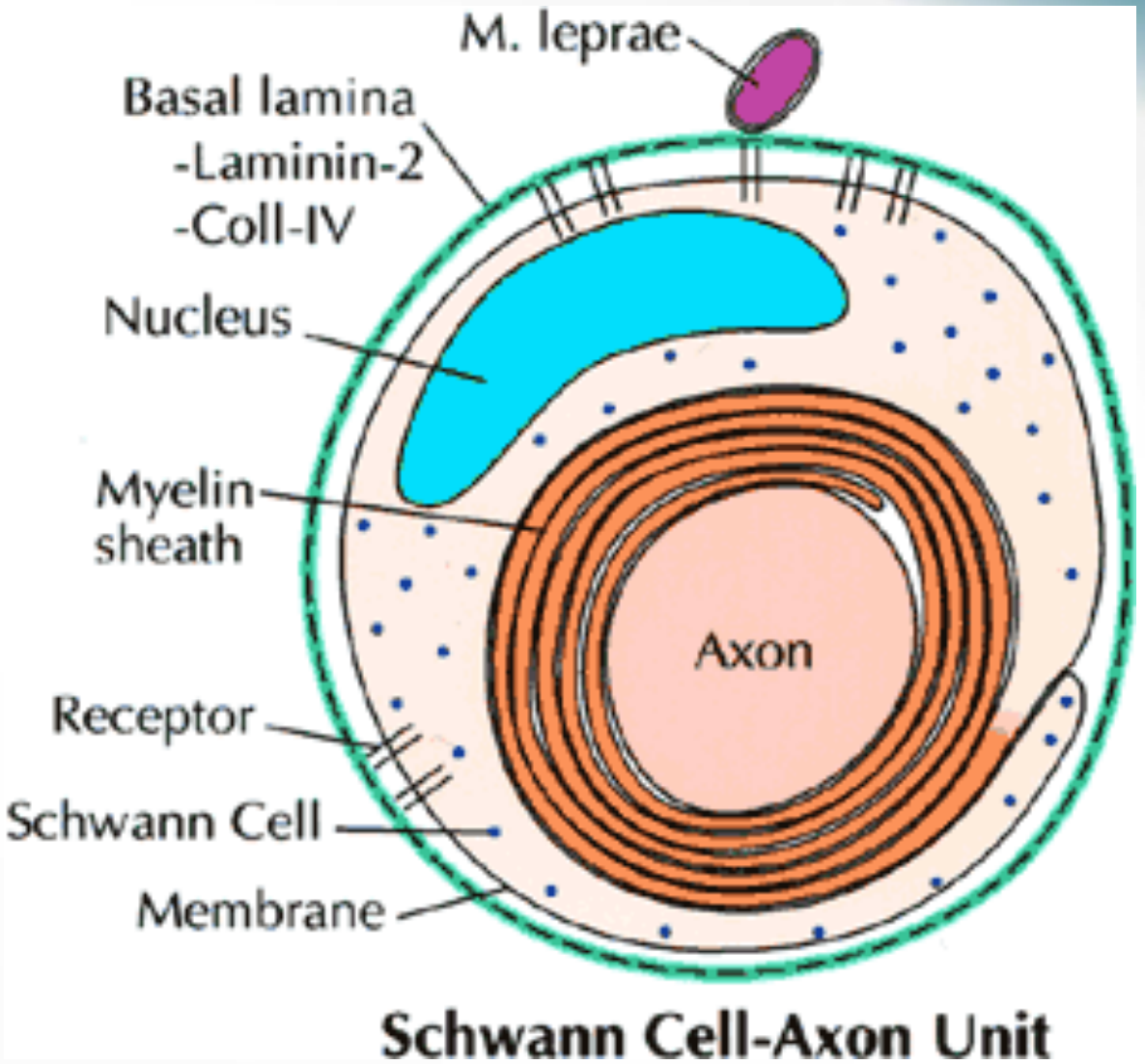


Muscle Innervation



Anatomy of a Nerve

- Axon
  - Signal conducting element
- Myelin
  - Insulating layer
  - Speeds conduction
- Schwann Cell
  - Produces myelin



Pathology: Nerve Compression

- Increase Pressure leads to Mechanical Distortion
  - Occludes small blood vessels
  - Changes local environment
  - Triggers spurious impulses in axons
  - Brain interprets as “pins and needles”
- Prolonged or Frequent Pressure
  - Schwann cells die
  - Myelin breaks down
  - Axons are exposed
  - Exposed axons more vulnerable

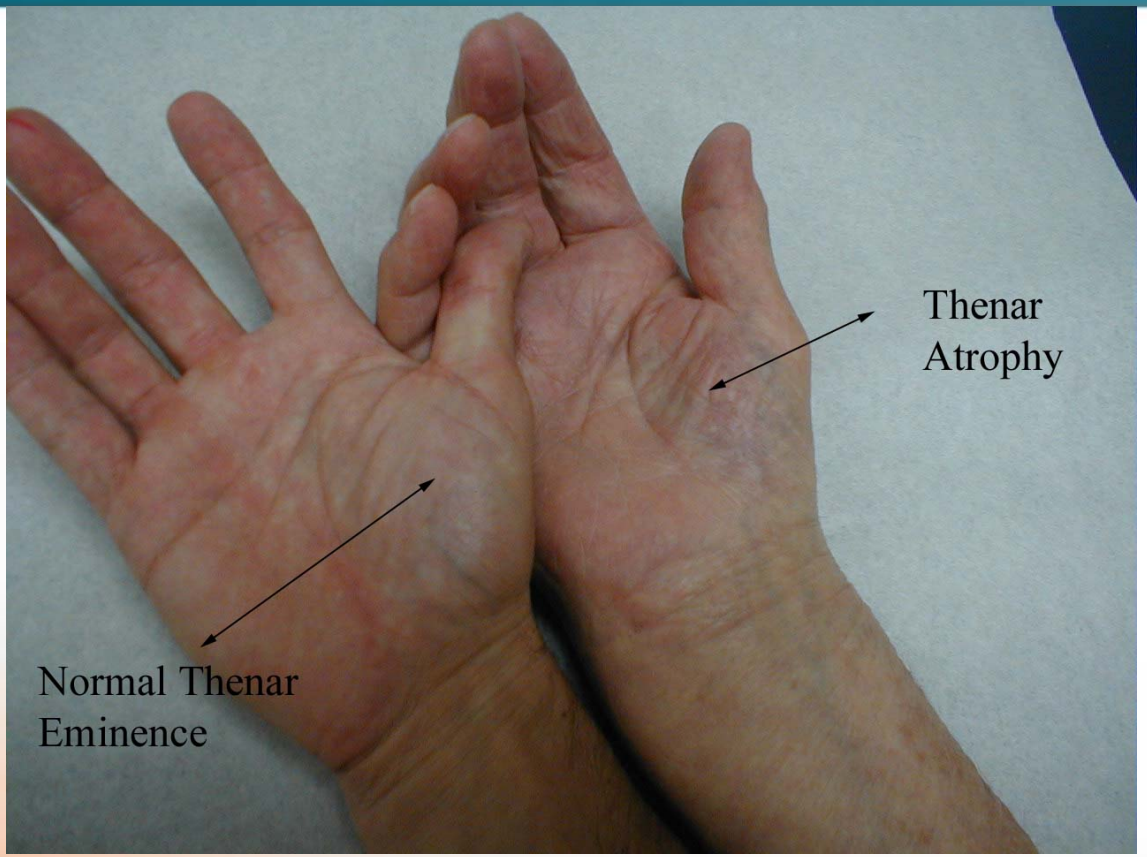
Progression of Illness

- Early stages
  - Episodic compression
  - Wake up with numb hand
  - Impaired sensation comes and goes
  - Schwann cells remyelinate the axon
- Later stages
  - Persistent compression
  - Extensive demyelination
  - Direct axonal damage
  - Constant numbness
  - Muscle atrophy

Stages of Pathology

- Precursor
- Mild
- Moderate
- Severe

Muscle Atrophy



Medical Risk Factors

- Factors altering normal anatomy
  - Bony changes distorting the 'floor' of the tunnel
    - OA, RA, fractures
  - Fluid retention increasing general tissue pressure
    - Pregnancy, diurnal variation (night time pain)
  - Tendon Changes/tissue thickening/scar tissue development
- Age
  - Increased age, 40-60 yo
  - Rare in children
- Women
  - 3x more likely
    - Smaller wrist size
    - Job differences
    - Pregnancy
    - post-partum
    - Menopause
- Smoking
  - Decreases blood flow to distal extremities 60 minutes for 1 cigarette
- Obesity
- Diabetes
- Gout
- Hypothyroidism
- Acromegaly
- Autoimmune Diseases
- Arthritis
- Poor posture
- Poor Nutrition
- Alcohol Abuse

Prevention

- Ergonomics
- Education
- Exercise
- Early intervention

Ergonomic Risk Factors

- Hand-Arm Vibration
- Awkward wrist posture
- Contact Stress
- Forceful Pinching
- Forceful Gripping
- Static Muscle Contractions
- Multipliers: Repetition, Frequency and Duration

Vibration Hazard Threshold

Moderate vibration: more than 2 hours/ day

- grinders
- sanders
- jig saws

High vibration: more than 30 minutes/day

- impact wrenches
- carpet strippers
- chain saws
- percussive tools
  - jack hammers
  - scalers
  - riveting or chipping hammers

Controlling Vibration Transmitted to the Hand and Arm

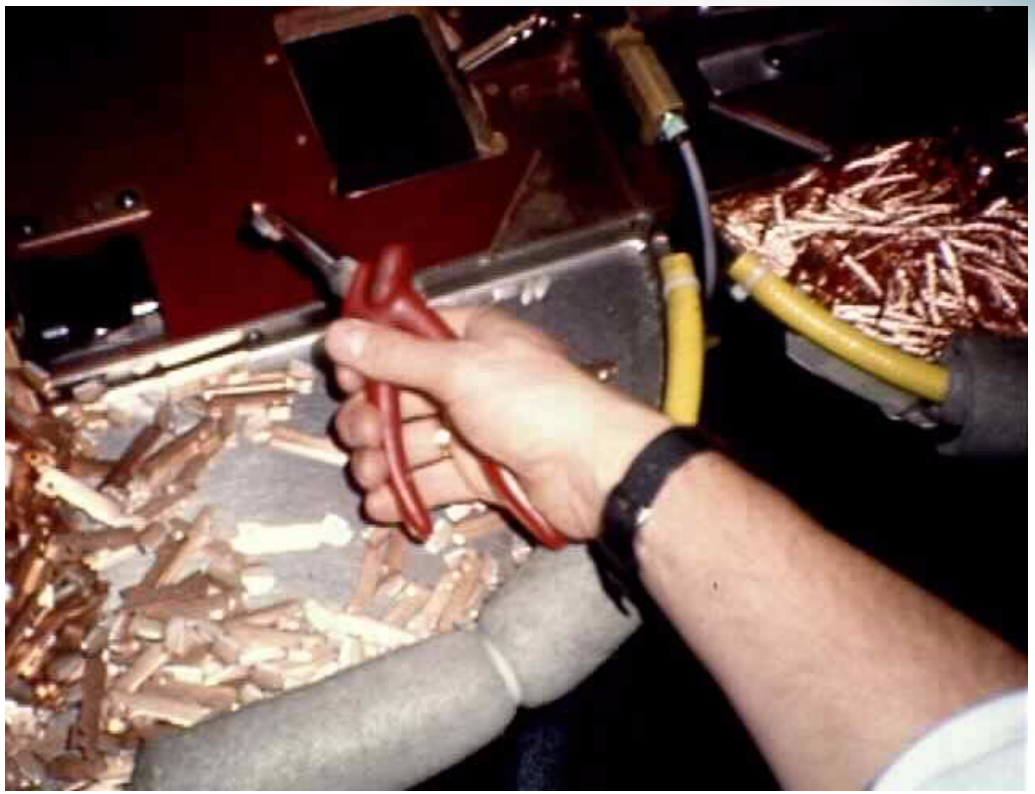
Use full fingered anti-vibration gloves

Tape existing handles with vibration dampening tape

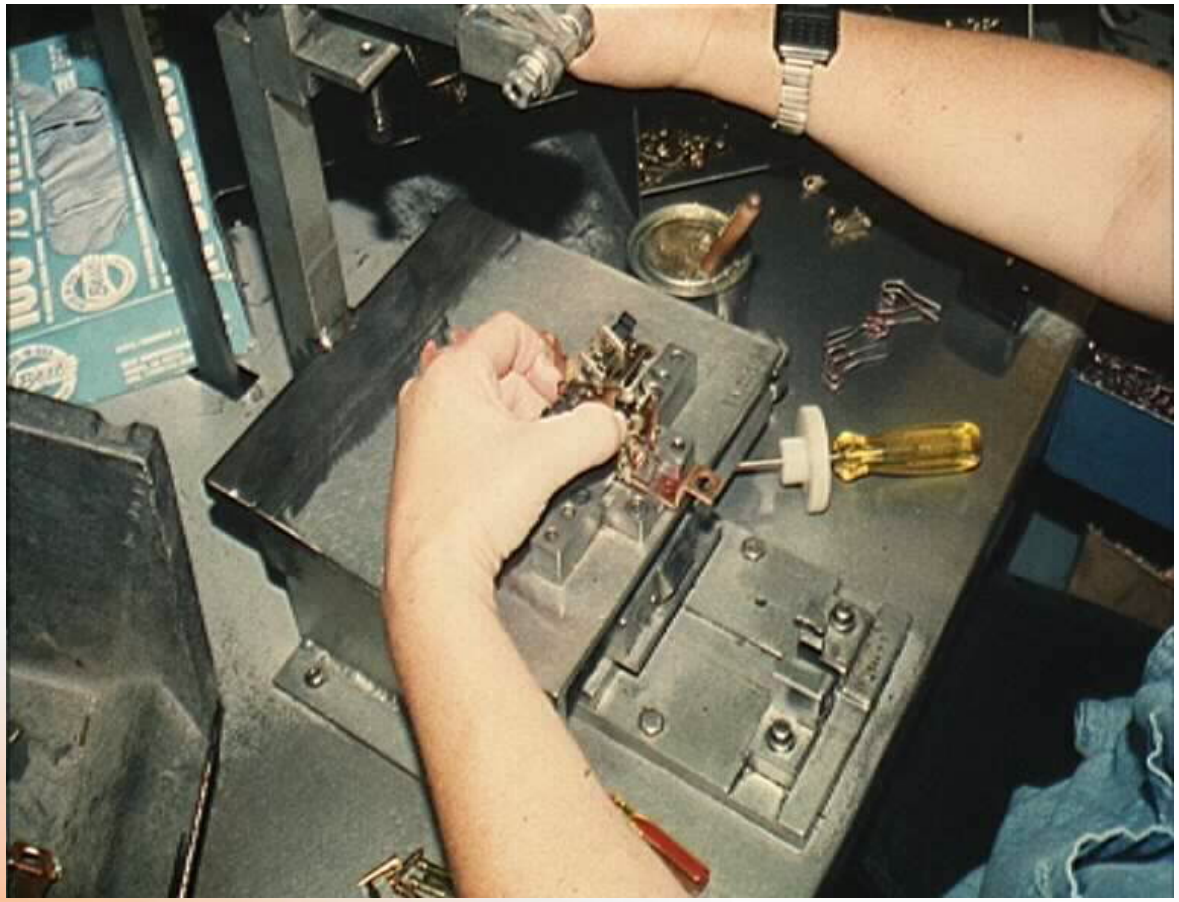
Suspend tools from tool balancers to reduce hand grip force

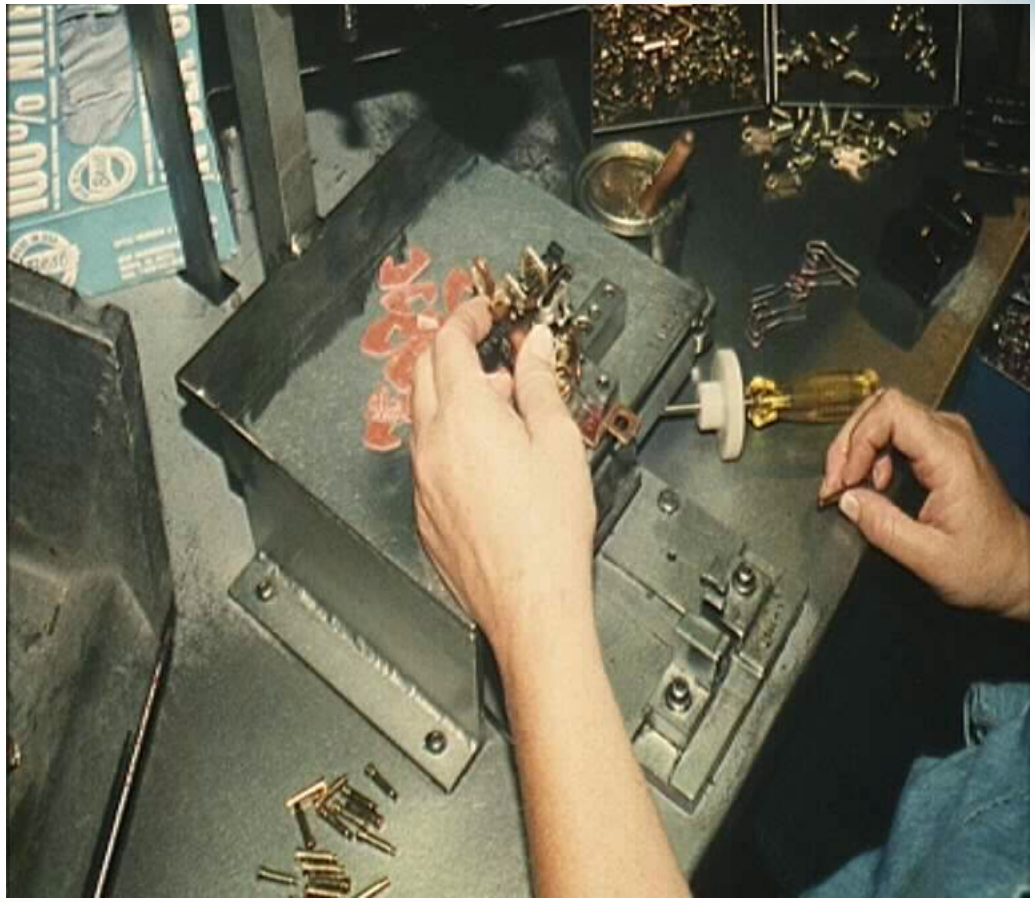
Regularly maintain and balance hand tools

Awkward Wrist Posture



Awkward Wrist Posture



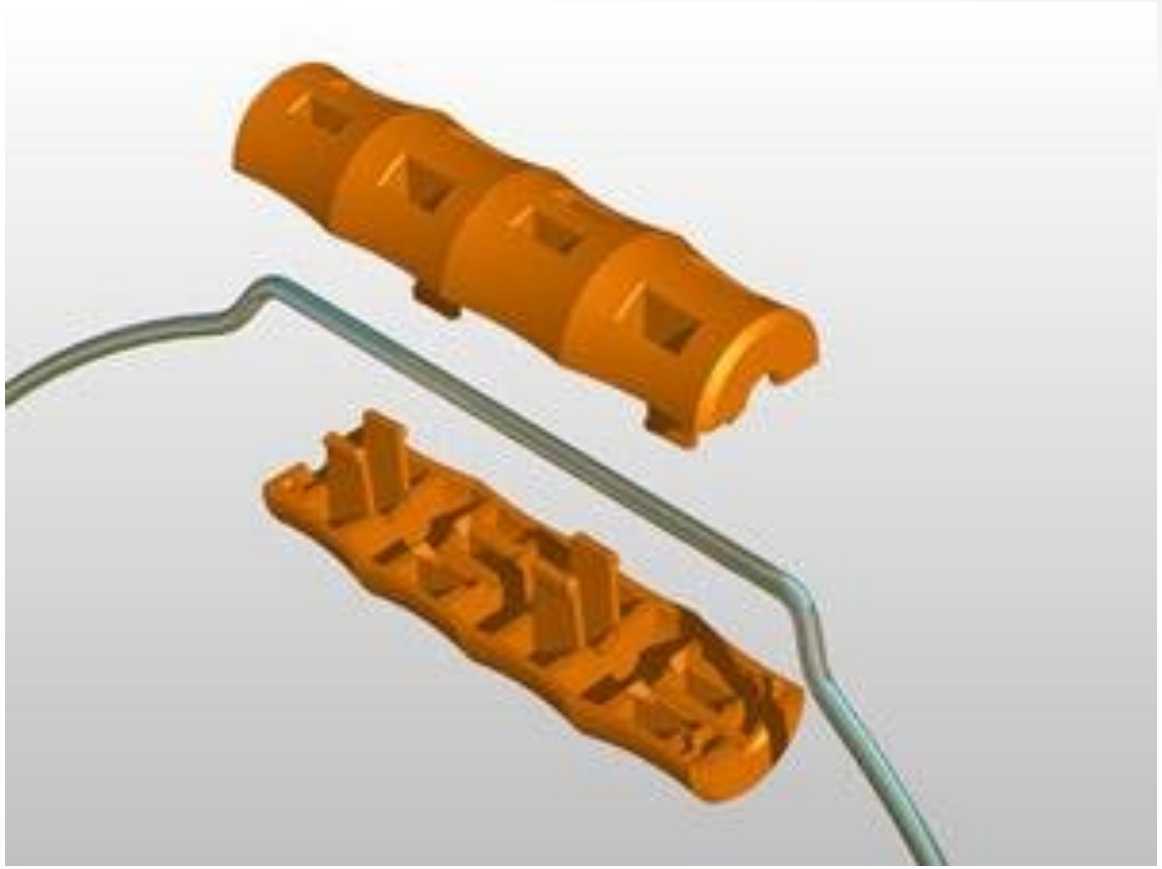


Awkward Wrist Posture & Contact Stress

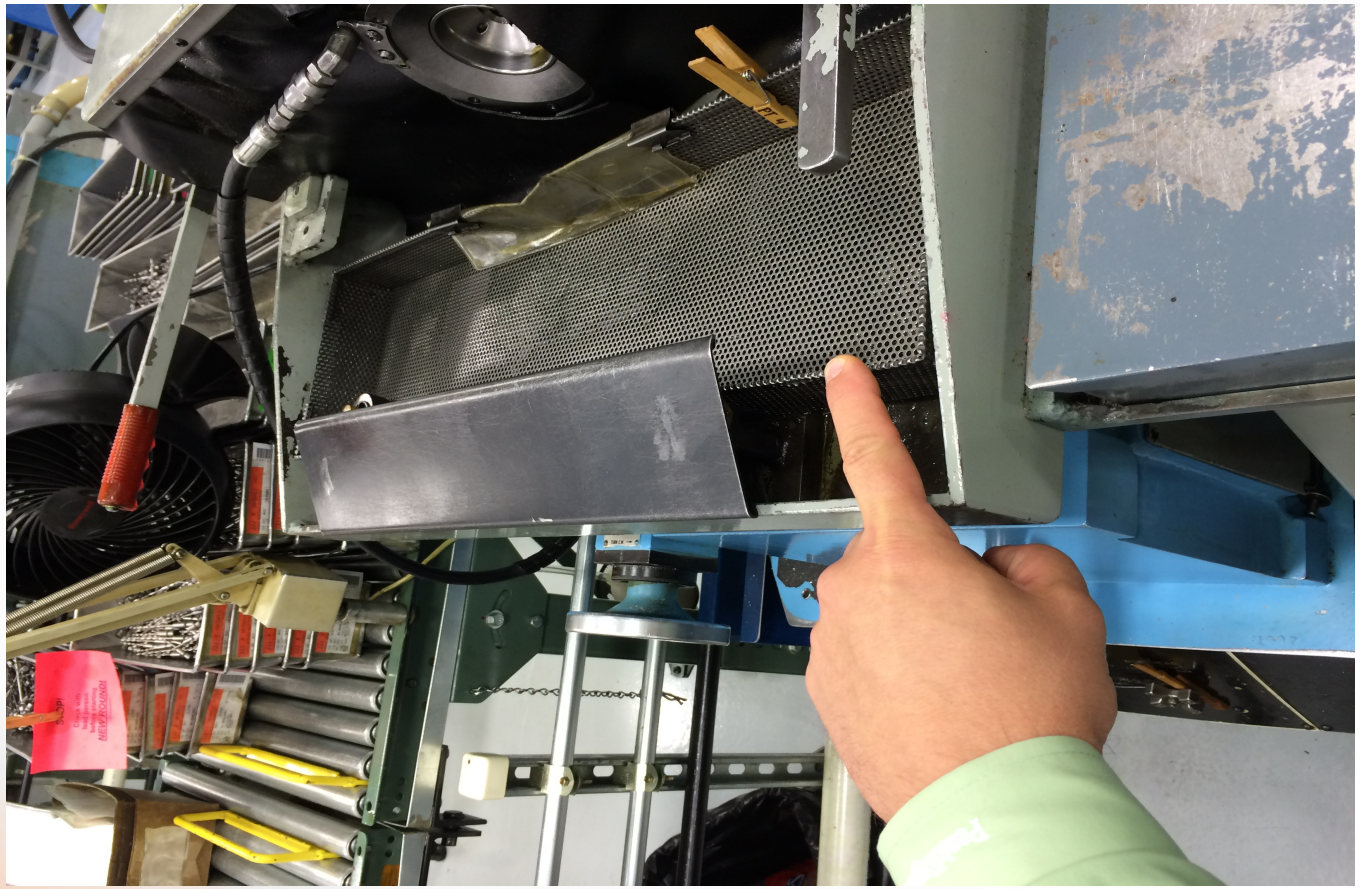
Contact Stress

Contact Stress with Grip Force

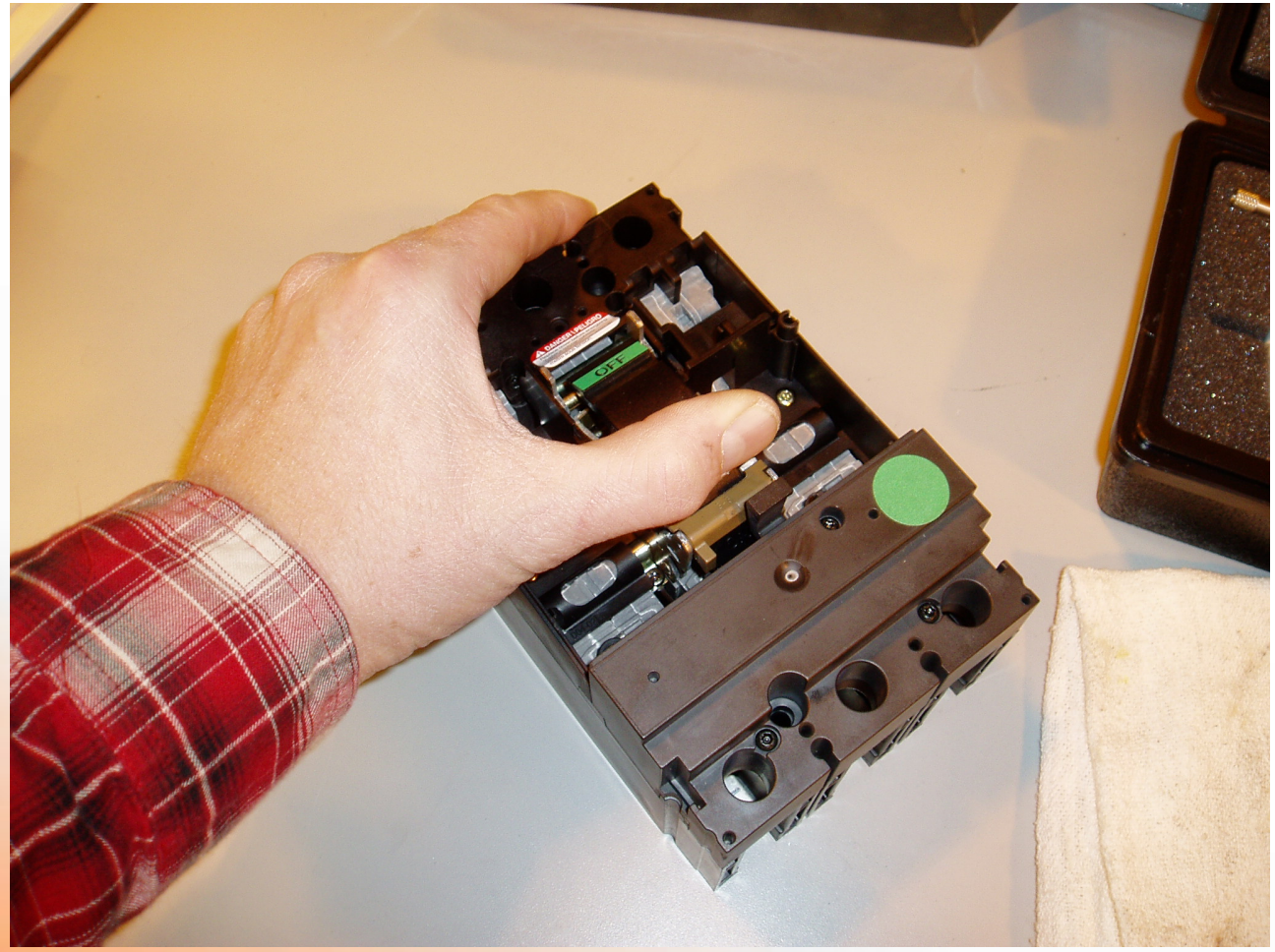
Contact Stress

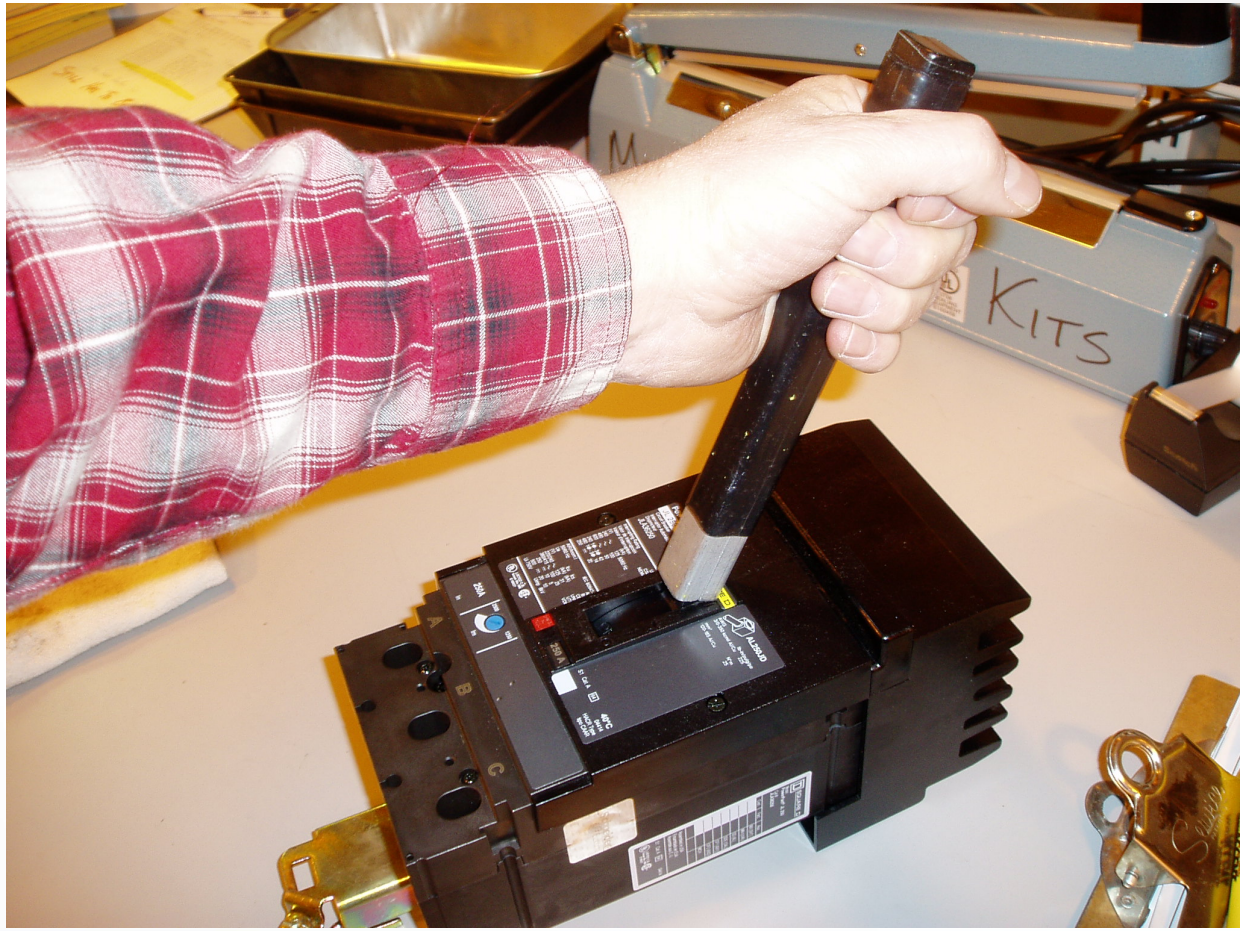


Contact Stress



Forceful Pinching & Gripping





Forceful Pinching & Gripping

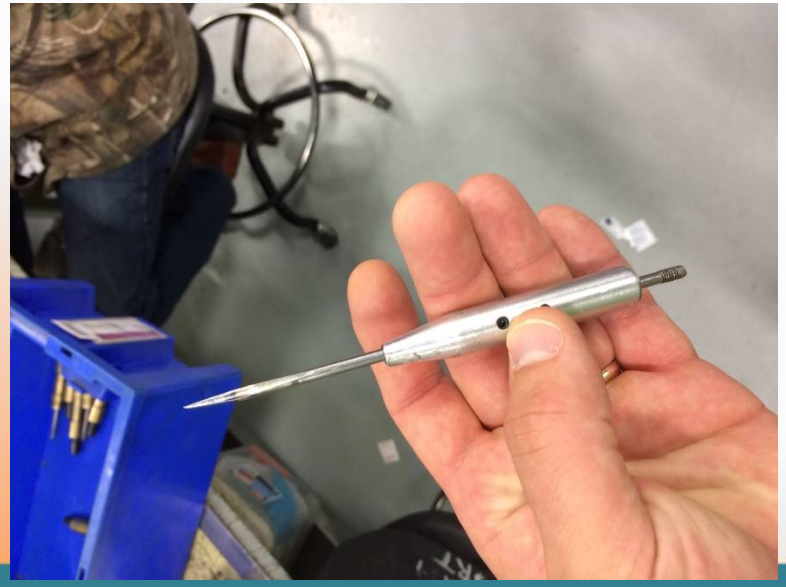
Forceful Pinching

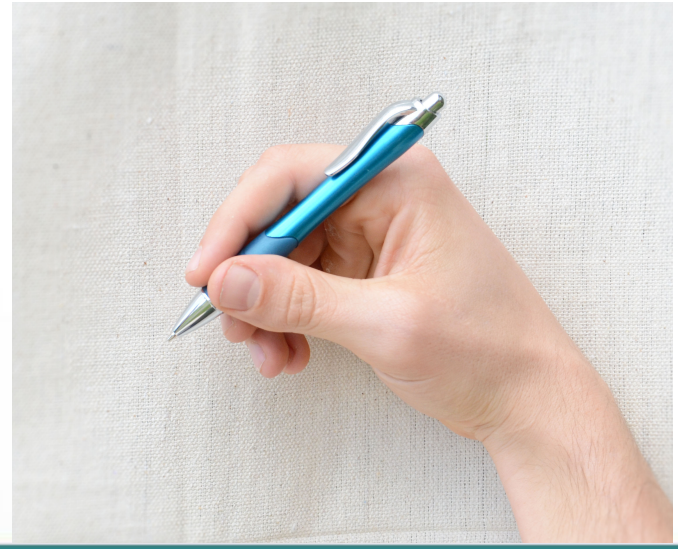
Forceful Pinching & Gripping

Contact Stress Forceful Gripping Awkward Posture

Forceful Pinching Awkward Thumb Posture

Forceful Pinching Stylus & Pen Handle





Repetition Frequency & Duration

Preventative Exercise

- Overwork of muscles can lead to muscle fatigue
- Muscle fatigue can lead to swelling of tendons
- Swelling of tendons can lead to nerve compression
- Fatigue Reduction Exercises:
  - Stretching
  - Gliding
  - Posture Correction

ACTIVE FLEXOR TENDON STRETCH

Start with elbows straight, palms up, bend wrist down so fingers point at floor & spread fingers apart.

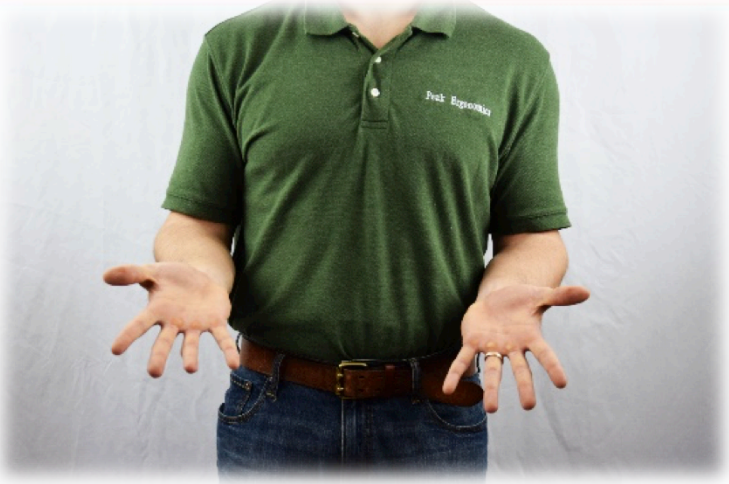
Move arms back and squeeze shoulder blades together & hold for FIVE seconds.

PASSIVE FLEXOR TENDON STRETCH

Start with elbow straight and palm up.
Bend wrist and fingers toward floor.

Use the other hand to gently pull down on palm and fingers, until you feel a stretch from your fingers to your elbow. Make sure that you are not pulling backwards on the fingers alone, but are pulling on the palm and fingers together. Hold for 5 seconds.

TENDON GLIDES



Spread thumb and fingers far apart
as wide as possible.
Hold for FIVE seconds…

Slowly make a hook hand and then straighten fingers for FIVE repetitions.

Slowly make a fist and then straighten fingers for FIVE repetitions.

TENDON GLIDES

Slowly make a fist but keep tips straight. Straighten fingers and repeat FIVE times.

Block fingers and slowly bend and straighten the ring finger for 5 reps, followed by the long finger for 5 reps, followed by the index finger for 5 reps.

TENDON GLIDES

Spread fingers apart wide, and then bring fingers together. Do for FIVE reps.

EASY NERVE GLIDE

Pose #1: Hold the baby.

Pose #2: Stop the car.

Perform SLOWLY for THREE repetitions in a gentle fluid motion on each side.

ACTIVE NECK STRETCH

Place hand behind back & other hand on top of shoulder.

Tilt head away. Hold for 5 sec.

Turn head down. Hold for 5 sec.

Turn head up. Hold for 5 sec.

POSTURE CORRECTION

Place hands in front of forehead with palms facing out. Take a deep breath in.

Slowly exhale while pulling elbows toward back pockets while rotating palms out. Squeeze shoulder blades together. Pull head back while chin is tucked.

Once you have fully exhaled, do 2 more reps.

ADVANCED NERVE STRETCH

Place arms out to side with palms up.

Bend wrists back so that fingers point down.

Look straight ahead. Tilt head to the side. Hold for 5 seconds. Perform both sides.

Education

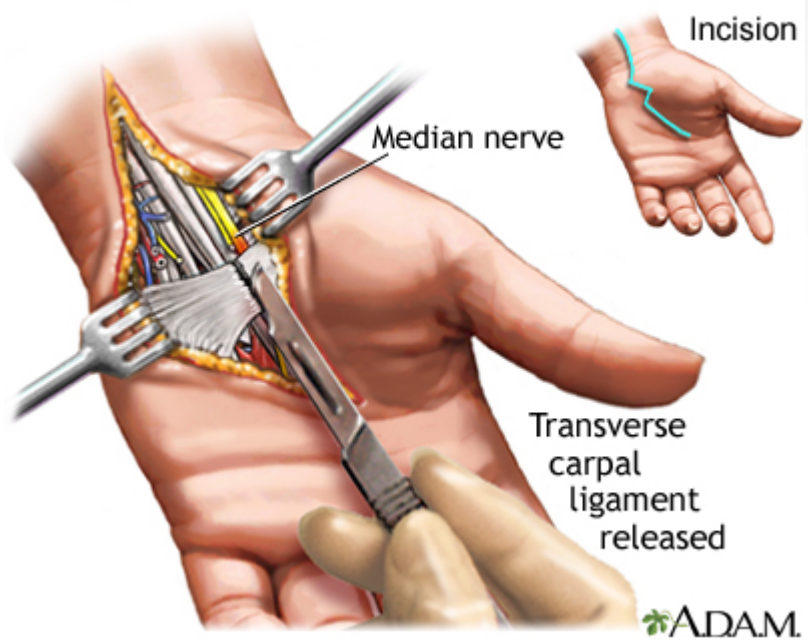
- Proper sleeping posture and night time supports
- Ice compression after working
- Body mechanics and ergonomic awareness
- Rest, hydration and nutrition
- Tobacco cessation
- Walking program & weight control
- Medical management of diseases
- Self massage techniques
- OTC medications
- PPE and non-rigid supports

Early Intervention

- Early Reporting: Employees report fatigue, discomfort, pain or numbness as early as possible.
- Rapid Response: Employer quickly responds with a customized and preventative ergonomic, exercise and education program.
- If a work related injury has already occurred, then initiate OSHA first aid treatment as appropriate: OTC medication, non-rigid supports, hot and cold therapy and massage.

Failed Prevention = Medical Treatment

- Anti-inflammatories
  - NSAID's
  - Corticosteroids
    - Oral
    - Local injections
- Surgical intervention
  - Chronic/longer standing symptoms
  - Failed conservative treatment approaches
  - Primary goal is to reduce pressure on the median nerve, surrounding ligaments, nerves and blood vessels by resecting the transverse carpal ligament



Carpal Tunnel Release Surgery

Recovery

- Keep arm elevated and use ice x 1 week after surgery
- May wear splint 1-2 weeks after surgery
- Stitches will be removed 10-14 days after surgery
- Avoid heavy gripping/lifting for at least 6 weeks
- May have 4-6 weeks of PT/OT
- May have residual pain/numbness for several months after surgery
- Full return to work: 1 week - 90+ days

Complications

- Injury to the median nerve or surrounding nerves to the hand
- Hypertrophic scarring
- Tendon adhesions
- Post operative infections
- Hematoma
- Arterial injury
- Complex Regional Pain Syndrome (CRPS, RSD)
- 2-5% Loss of grip strength
- 8-10% perceived failure rate
- 50-60% overall success rate

Carpal Tunnel Surgery Work Comp Costs

- Average Medical: $13,536
- Average PPD: $17,017
- Average TTD: $1,856
- Total Direct Cost: $32,409
- Indirect Cost: $35,650 (direct x 1.1)
- Total Cost: $68,059
- 10% Profit Margin = $680,590 loss in sales
- 3% Profit Margin = $2,266,365 loss in sales